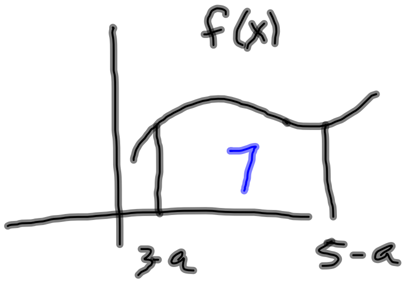
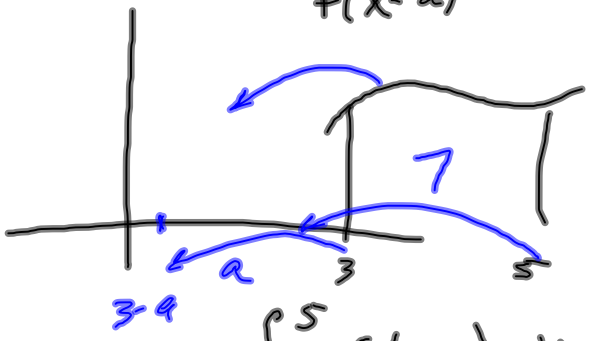
75



shift right · "a"

$f(x-a)$



$$\int_{3-a}^{5-a} f(x)\,dx \qquad \int_{3}^{5} f(x-a)\,dx$$

$$F(5-a)-F(3-a) = F(5-a)-F(3-a)$$

Dec 11-11:01 AM

22 $\displaystyle\int \frac{9r^2\,dr}{\sqrt{1-r^3}}$

67. $\displaystyle\frac{1}{4}\int_0^1 \frac{4x^3\,dx}{\sqrt{x^4+9}}$ $\quad u = x^4+9 \quad du = 4x^3\,dx$

$x=0 \quad u=9$

$x=1 \quad u=10$

$$\frac{1}{4}\int_9^{10} \frac{du}{\sqrt{u}} = \frac{1}{4}\,\frac{u^{\frac{1}{2}}}{\frac{1}{2}}\Big|_9^{10} = \frac{2}{4}\left(\sqrt{10}-\sqrt{9}\right)$$

$u^{-\frac{1}{2}}$

$$= \frac{2}{4}\sqrt{x^4+9}\Big|_0^1 = \frac{2}{4}\left(\sqrt{10}-\sqrt{9}\right)$$

Dec 11-11:08 AM

48 $\int \sec^4 dx$ $\sec^2 x = 1 + \tan^2 x$

$\int \sec^2 x \cdot \sec^2 x \, dx$

$\int (1+\tan^2 x) \sec^2 x dx = \int 1+u^2 \, du$

$u = \tan x$

$du = \sec^2 x \, dx$

Dec 11-11:17 AM

6.3 Integration by parts

often used to integrate a product

also to integrate $\int \ln x \, dx$, $\int \tan^{-1} x \, dx$

$$\int u \, dv = uv - \int v \, du$$

easier

$\int x \cos x \, dx \rightarrow x \sin x - \int \sin x \, dx$

let $u = x$ $\cos x \, dx = dv$

$du = dx$ $\sin x = v$

$= x \sin x - (-\cos x) + C$

$= x \sin x + \cos x + C$

Dec 11-11:19 AM

u = l i p e t

log	inverse trig	poly	exp	trig
l	i	p	e	t
o	n	o	x	r
g	v	l	p	i
	e	y		g
	r			
	s			
	e			
	t			
	r			
	i			
	g			

Dec 11-11:27 AM

$$\int x^2 e^x \, dx = x^2 e^x - \int e^x 2x \, dx$$

$u = x^2$ $e^x dx = dv$

$du = 2x dx$ $v = e^x$

$$= x^2 e^x - 2 \int x e^x \, dx$$

do it again

$u = x$ $e^x dx = dv$

$du = dx$ $v = e^x$

$$= x^2 e^x - 2\left(x e^x - \int e^x \, dx \right)$$

$$= x^2 e^x - 2xe^x + 2e^x + c$$

Dec 11-11:29 AM

tabular integration - a shortcut to do integration by parts

poly $e^x, \sin x, \cos x$

$$\int x^2 e^x \, dx = x^2 e^x - 2x e^x + 2e^x + C$$

take der take antider

x^2 + e^x

$2x$ − e^x

2 + e^x

0 e^x

signs alternate
start with +

Dec 11-11:36 AM

$$\int x^2 \sin x \, dx = -x^2 \cos x + 2x \sin x + 2 \cos x + C$$

x^2 + $\sin x$

$2x$ − $-\cos x$

2 + $-\sin x$

0 $\cos x$

Dec 11-11:40 AM

$$\int \ln x \cdot 1\, dx = x\ln x - \int x \frac{1}{x} dx = x\ln x - x + c$$

$u = \ln x \quad 1 \cdot dx = dv$

$du = \frac{1}{x} dx \quad v = x$

Dec 11-11:43 AM

Ex 4

$$\int e^x \cos x\, dx = e^x \sin x - \int e^x \sin x\, dx$$

$u = e^x \quad dv = \cos x\, dx$ | $u = e^x \quad dv = \sin x\, dx$

$du = e^x dx \quad v = \sin x$ | $du = e^x dx \quad v = -\cos x$

$$= e^x \sin x - \left(-e^x \cos x - \int -\cos x\, e^x\, dx\right)$$

$$\int e^x \cos x\, dx = e^x \sin x + e^x \cos x - \int e^x \cos x\, dx$$

$+ \int e^x \cos x\, dx \qquad + \int e^x \cos x\, dx$

$$2\int e^x \cos x\, dx = \frac{e^x \sin x + e^x \cos x}{2} + C$$

Dec 11-11:46 AM